

Description:

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used. MLCC is made by NP0, X7R, X6S, X5R and Y5V dielectric material and which provides product with high electrical precision, stability and reliability.

Features:

- A wide selection of sizes is available (0402 to 1812)
- High capacitance in given case size
- Capacitor with lead-free termination (pure Tin)

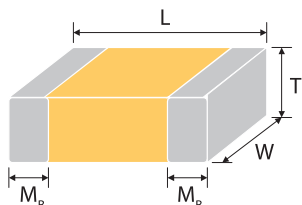
Applications:

- For general digital circuit
- For power supply bypass capacitors
- For consumer electronics
- For telecommunication

How To Order:

MC	1206	B	104	K	500	C	T
	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging style
Multi-comp	Inch (mm) 0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	N = NP0 (C0G) B = X7R F = Y5V X=X5R S=X6S	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5 = 0.5pF 1R0 = 1.0pF 104 = 10×10^4 = 100nF	A=±0.05pF B=±0.1pF C=±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% Z = -20/+80%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 4R0=4 VDC 6R3=6.3 VDC 100=10 VDC 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC	C = Cu/Ni/Sn	T=7" reeled G=13" reeled

External Dimensions:



The outline of MLCC

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	MB (mm)
01R5 (0402)	0.4±0.02	0.2±0.02	0.2±0.02	V	R	0.10±0.03
0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	0.15±0.05
	0.6±0.05 ^{#2}	0.3±0.05 ^{#2}	0.3±0.05 ^{#2}			0.15+0.1/-0.05
	0.6±0.09 ^{#3}	0.3±0.09 ^{#3}	0.3±0.09 ^{#3}			
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10
			0.50+0.02/-0.05	Q	R	
	1.00±0.20	0.50±0.20	0.5±0.20	E	R	
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	R / W	0.40±0.15
	1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10	H	R / W	
			0.80+0.15/-0.10	X	R / W	
	1.60±0.20 ^{#1}	0.80±0.20 ^{#1}	0.8±0.20 ^{#1}			

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		Soldering Method *	MB (mm)
0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20
			0.60±0.10	A	R / W	
			0.80±0.10	B	R / W	
			1.25±0.10	D	R	
	2.00±0.20	1.25±0.20	0.85±0.10 ^{#4}	T ^{#4}	R / W	
			1.25±0.20	I	R	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) ^{***}
			0.95±0.10	C	R	
			1.25±0.10	D	R	
	3.20±0.20	1.60±0.20	1.15±0.15	J	R	
			1.60±0.20	G	R	
			0.85±0.10	T	R / W	
	3.20+0.30/-0.10	1.60+0.30/-0.10	1.60+0.30/-0.10	P	R	
1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	R	0.75±0.25
			0.85±0.10	T	R	
			1.25±0.10	D	R	
	3.20±0.40	2.50±0.30	1.60±0.20	G	R	
			2.00±0.20	K	R	
			2.50±0.30	M	R	
1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	2.03±0.25	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}
			1.40±0.15	F	R	
			1.60±0.20	G	R	
			2.00±0.20	K	R	
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	3.20±0.30	1.25±0.10	D	R	0.75±0.25 (0.5±0.25) ^{***}
			1.60±0.20	G	R	
			2.00±0.20	K	R	
		3.20±0.40	2.50±0.30	M	R	
			2.80±0.30	U	R	

* R = Reflow soldering process ; W = Wave soldering process.

** For 1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

*** For 1206_1000V ~3kV, 1808_200V ~3kV, 1812_200V~3kV and safety certificated products.

#1 : For 0603/Cap≥10μF or 0603(>10V)/Cap>1μF products.

#2 : For 0201/Cap≥0.68μF products.

#3 : For 0201/Cap≥1μF products.

#4 : For 0805/0.22μF/100V/ T thickness:0.85+0.15/-0.1(mm)

General Electrical Data:

Dielectric	NP0	X7R	Y5V	X5R	X6S
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812				
Capacitance range*	0.1pF to 0.1μF	100pF to 47μF	0.01μF to 100μF	100pF to 220μF	0.1μF to 100μF
Capacitance tolerance**	Cap≤5pF#1 : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)	K (±10%), M (±20%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V,100V	6.3V, 10V, 16V, 25V, 50V, 100V		4V, 6.3V, 10V, 16V, 25V, 50V	
DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1			
Operating temperature	-55 to +125°C		-25°C to +85°C	-55°C to +85°C	-55°C to +105°C
Capacitance characteristic	±30ppm	±15%	+30/-80%	±15%	±22%
Termination	Ni/Sn (lead-free termination)				

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide C tolerance.

* Measured at the condition of 30~70% related humidity.

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R/X6S/X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

Note 1:

X7R/X5R/X6S

Rated vol.	D.F.≤	Exception of D.F.≤	
≥100V	≤2.5%	≤3%	1206 ≥ 0.47μF
		≤5%	0805 > 0.1μF; 0603 ≥ 0.068μF; 1206 > 1μF; 1210 ≥ 2.2μF; TT series
50V	≤2.5%	≤3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤5%	1210 ≥ 4.7μF
		≤10%	0402 ≥ 0.1μF; 0603 > 0.1μF; 0805 ≥ 1μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF; TT series
35V	≤3.5%	≤10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
25V	≤3.5%	≤5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
		≤7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF
		≤10%	0201 ≥ 0.1μF; 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF; TT series
		≤12.5%	0402 ≥ 0.47μF

General Purpose Multilayer Ceramic Capacitor

0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Rated vol.	D.F.≡	Exception of D.F.≡	
16V	≡3.5%	≡5%	0201≡0.01μF;0402≡0.033μF;0603≡0.15μF;0805≡0.68μF;1206≡2.2μF;1210≡4.7μF
		≡10%	0201≡0.1μF; 0402≡0.22μF; 0603≡0.68μF;0805≡2.2μF;1206≡4.7μF; 1210≡22μF; TT series
10V	≡5%	≡10%	0201≡0.012μF;0402≡0.33μF(0402/X7R≡0.22μF); TT series 0603≡0.33μF; 0805≡2.2μF;1206≡2.2μF;1210≡22μF; 01R5
		≡15%	0201≡0.1μF; 0402≡1μF
6.3V	≡10%	≡15%	0201≡0.1μF;0402≡1μF;0603≡10μF; 0805≡4.7μF;1206≡47μF :1210≡100μF; TT series
		≡20%	0402≡2.2μF
4V	≡15%	-	-

Y5V

Rated vol.	D.F.≡	Exception of D.F.≡	
≡50V	≡5%	≡7%	0603≡0.1μF; 0805≡0.47μF; 1206≡4.7μF; TT series
		≡12.5%	1210≡6.8μF
35V	≡7%	-	-
25V	≡5%	≡7%	0402≡0.047μF;0603≡0.1μF; 0805≡0.33μF; 1206≡1μF; 1210≡4.7μF
		≡9%	0402≡0.068μF;0603≡0.47μF; 1206≡4.7μF; 1210≡22μF; TT series
16V (C<1.0μF)	≡7%	≡9%	0402≡0.068μF; 0603≡0.68μF
		≡12.5%	0402≡0.22μF
16V (C<1.0μF)	≡9%	≡12.5%	0603≡2.2μF; 0805≡3.3μF;1206≡10μF; 1210≡22μF; 1812≡47μF; TT series
10V	≡12.5%	≡20%	0402≡0.47μF
6.3V	≡20%	-	-

Capacitance Range

NP0 Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	0.1pF (0R1)	L	L	L	N	N	N	N											
	0.2pF (0R2)	L	L	L	N	N	N	N											
	0.3pF (0R3)	L	L	L	N	N	N	N		S	S	S	S						
	0.4pF (0R4)	L	L	L	N	N	N	N		S	S	S	S						
	0.5pF (0R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A

www.element14.com
www.farnell.com
www.newark.com



General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	1.0pF (1R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	82pF (820)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	120pF (121)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	150pF (151)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	180pF (181)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	220pF (221)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	270pF (271)				N	N	N	N		S	S	S	S	S	A	A	A	A	A
	330pF (331)				N	N	N	N		S	S	S	S	S	A	A	A	A	A
	390pF (391)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	470pF (471)				N	N	N	N		S	S	S	S	S	B	B	B	B	B

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0																	
Size		0201			0402					0603					0805				
Rated Voltage (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
Capacitance	560pF (561)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	680pF (681)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	820pF (821)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	1,000pF (102)				N	N	N	N		S	S	S	S	S	B	B	B	B	B
	1,200pF (122)									X	X	X	X	X*	B	B	B	B	B
	1,500pF (152)									X	X	X	X	X*	B	B	B	B	B
	1,800pF (182)									X	X	X	X		B	B	B	B	B
	2,200pF (222)									X	X	X	X		B	B	B	B	B
	2,700pF (272)									X	X	X	X		D	D	D	D	D
	3,300pF (332)									X	X	X	X		D	D	D	D	D
	3,900pF (392)									X*	X*	X*	X*		D	D	D	D	D
	4,700pF (472)									X*	X*	X*	X*		D	D	D	D	D
	5,600pF (562)									X*	X*	X*	X*		D	D	D	D	D
	6,800pF (682)									X*	X*	X*	X*		D	D	D	D	D
	8,200pF (822)									X*	X*	X*	X*		D	D	D	D	
	0.010uF (103)									X*	X*	X*	X*		D	D	D	D	
	0.012uF (123)														T*	T*	T*	T*	
	0.015uF (153)														T*	T*	T*	T*	
	0.018uF (183)														D*	D*	D*	D*	
	0.022uF (223)														D*	D*	D*	D*	

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with " * " mark is expressed capacitance tolerance "J" (±5%) only.

NP0 Dielectric 1206, 1210, 1812 Sizes

Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	1.0pF (1R0)														
	1.2pF (1R2)	B	B	B	B	B									
	1.5pF (1R5)	B	B	B	B	B									
	1.8pF (1R8)	B	B	B	B	B									
	2.2pF (2R2)	B	B	B	B	B									
	2.7pF (2R7)	B	B	B	B	B									
	3.3pF (3R3)	B	B	B	B	B									
	3.9pF (3R9)	B	B	B	B	B									
	4.7pF (4R7)	B	B	B	B	B									
	5.6pF (5R6)	B	B	B	B	B									
	6.8pF (6R8)	B	B	B	B	B									
	8.2pF (8R2)	B	B	B	B	B									
	10pF (100)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	12pF (120)	B	B	B	B	B	C	C	C	C	C	D	D	D	D

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	15pF (150)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	18pF (180)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	22pF (220)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	27pF (270)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	33pF (330)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	39pF (390)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	47pF (470)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	56pF (560)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	68pF (680)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	82pF (820)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	100pF (101)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	120pF (121)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	150pF (151)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	180pF (181)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	220pF (221)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	270pF (271)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	330pF (331)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	390pF (391)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	470pF (471)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	560pF (561)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	680pF (681)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	820pF (821)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	1,000pF (102)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	1,200pF (122)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	1,500pF (152)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	1,800pF (182)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	2,200pF (222)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	2,700pF (272)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	3,300pF (332)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	3,900pF (392)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	4,700pF (472)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	5,600pF (562)	B	B	B	B	B	C	C	C	C	C	D	D	D	D
	6,800pF (682)	C	C	C	C	C	C	C	C	C	C	D	D	D	D
	8,200pF (822)	D	D	D	D	D	C	C	C	C	C	D	D	D	D
	0.010μF (103)	D	D	D	D	D	C	C	C	C	C	D	D	D	D
	0.012μF (123)	P	P	P	P	P	D	D	D	D	D	D	D	D	D
0.015μF (153)	P	P	P	P	P	D	D	D	D	D	D	D	D	D	
0.018μF (183)	P	P	P	P	P	K	K	K	K	K	D	D	D	D	
0.022μF (223)	P	P	P	P	P	K	K	K	K	K	D	D	D	D	
0.027μF (273)	P	P	P	P		K	K	K	K	K	D	D	D	D	
0.033μF (333)	P	P	P	P		K	K	K	K	K	D	D	D	D	
0.039μF (393)	P	P	P	P							M	M	M	M	

General Purpose Multilayer Ceramic Capacitor

0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		NP0													
Size		1206					1210					1812			
Rated Voltage (VDC)		10	16	25	50	100	10	16	25	50	100	16	25	50	100
Capacitance	0.047µF (473)	J*	J*	J*	J*							M	M	M	M
	0.056µF (563)	J*	J*	J*	J*							M	M	M	M
	0.068µF (683)	G*	G*	G*	G*							M	M	M	M
	0.082µF (823)	G*	G*	G*	G*							M	M	M	M
	0.1µF (104)	G*	G*	G*	G*							M	M	M	M

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “*” mark is expressed capacitance tolerance “J” (±5%) only.

X7R Dielectric 0201, 0402, 0603, 0805 Sizes

Dielectric		X7R																							
Size		0201					0402					0603						0805							
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
Capacitance	100pF (101)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	120pF (121)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	150pF (151)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	180pF (181)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	220pF (221)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	270pF (271)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	330pF (331)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	390pF (391)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	470pF (471)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	560pF (561)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	680pF (681)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	820pF (821)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,000pF (102)	L	L	L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,200pF (122)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,500pF (152)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,800pF (182)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	2,200pF (222)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	2,700pF (272)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	3,300pF (332)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	3,900pF (392)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	4,700pF (472)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	5,600pF (562)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	6,800pF (682)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	8,200pF (822)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	0.010μF (103)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	0.012μF (123)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.015μF (153)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.018μF (183)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.022μF (223)							N	N	N	N			S	S	S	S	X		B	B	B	B	B	
	0.027μF (273)							N	N	N				S	S	S	S	X		B	B	B	B	D	

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X7R																							
Size		0201					0402						0603						0805						
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
Capacitance	0.033µF (333)							N	N	N	N			S	S	S	X	X		B	B	B	B	D	
	0.039µF (393)							N	N	N				S	S	S	X	X		B	B	B	B	D	
	0.047µF (473)							N	N	N	N				S	S	S	X	X		B	B	B	B	D
	0.056µF (563)							N	N						S	S	S	X	X		B	B	B	B	D
	0.068µF (683)							N	N		N				S	S	S	X	X		B	B	B	B	D
	0.082µF (823)							N	N						S	S	S	X	X		B	B	B	B	D
	0.10µF (104)							N	N	N	N	N			S	S	S	X	X		B	B	B	B	D
	0.12µF (124)														S	S	X				B	B	B	D	
	0.15µF (154)														S	S	X				D	D	D	D	
	0.18µF (184)														S	S	X				D	D	D	D	
	0.22µF (224)							N	N	N	N				S	S	X	X			D	D	D	D	T
	0.27µF (274)													X	X	X	X				D	D	D	I	
	0.33µF (334)													X	X	X	X				D	D	D	I	
	0.39µF (394)													X	X	X	X				D	D	D	I	
	0.47µF (474)							N	N					X	X	X	X	X			D	D	D	I	I
	0.56µF (564)													X	X	X					D	D	D		
	0.68µF (684)													X	X	X					D	D	D		
	0.82µF (824)													X	X	X					D	D	D		
	1.0µF (105)							N						X	X	X	X	X			D	D	D	I	
	1.5µF (155)																				I	I	I		
	2.2µF (225)													X	X	X					I	I	I	I	I
	3.3µF (335)																								
	4.7µF (475)																				I	I	I	I	
	6.8µF (685)																								
	10µF (106)																				I	I	I*		
	22µF (226)																								

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “ * ” mark is expressed product not in 10% (code “K”) tolerance.

X7R Dielectric 1206, 1210, 1812 Sizes

Dielectric		X7R																	
Size		1206						1210						1812					
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	100pF (101)																		
	120pF (121)																		
	150pF (151)		B	B	B		B	B											
	180pF (181)		B	B	B		B	B											
	220pF (221)		B	B	B		B	B											
	270pF (271)		B	B	B		B	B											
	330pF (331)		B	B	B		B	B											
	390pF (391)		B	B	B		B	B											
	470pF (471)		B	B	B		B	B											
	560pF (561)		B	B	B		B	B											

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X7R																	
Size		1206						1210						1812					
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	680pF (681)		B	B	B		B	B											
	820pF (821)		B	B	B		B	B											
	1,000pF (102)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,200pF (122)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,500pF (152)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,800pF (182)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	2,200pF (222)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	2,700pF (272)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	3,300pF (332)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	3,900pF (392)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	4,700pF (472)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	5,600pF (562)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	6,800pF (682)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	8,200pF (822)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.010μF (103)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.012μF (123)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.015μF (153)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.018μF (183)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.022μF (223)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.027μF (273)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.033μF (333)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.039μF (393)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.047μF (473)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.056μF (563)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.068μF (683)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.082μF (823)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D
	0.10μF (104)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D
	0.12μF (124)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D
	0.15μF (154)		C	C	C		C	G		C	C	C	C	C	D	D	D	D	D
	0.18μF (184)		C	C	C		C	G		C	C	C	C	C	D	D	D	D	D
	0.22μF (224)		C	C	C		C	G		C	C	C	C	C	D	D	D	D	D
	0.27μF (274)		C	C	C		D	G		C	C	C	C	C	G	D	D	D	D
	0.33μF (334)		C	C	C		D	G		C	C	C	D	G	D	D	D	D	D
	0.39μF (394)		C	C	J		P	G		C	C	C	D	M	D	D	D	D	D
0.47μF (474)		J	J	J		P	G		C	C	C	D	M	D	D	D	D	K	
0.56μF (564)		J	J	J		P	P		D	D	D	D	M	D	D	D	D	K	
0.68μF (684)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	
0.82μF (824)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	
1.0μF (105)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	
1.5μF (155)	J	J	J	P						K	G	M	M					K	
2.2μF (225)	J	J	J	P		P	P				K	G	M	M			M	M	
3.3μF (335)		P	P	P						K	G								
4.7μF (475)	P	P	P	P		P			K	K	K	M							
6.8μF (685)																			

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X7R																	
Size		1206							1210							1812			
Rated Voltage (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
Capacitance	10μF (106)	P	P	P	P	P				K	K	K	M						
	22μF (226)	P	P	P*						M	M	M							
	47μF (476)								M	M									
	100μF (107)																		

1. The letter in cell is expressed the symbol of product thickness.
2. The letter in cell with “*” mark is expressed product not in 10% (code “K”) tolerance.

Y5V Dielectric 0402, 0603, 0805 Sizes

Dielectric		Y5V															
Size		0402					0603					0805					
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010µF (103)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.015µF (153)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.022µF (223)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.033µF (333)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.047µF (473)		N	N	N			S	S	S	S		A	A	A	A	B
	0.068µF (683)		N	N	N			S	S	S	S		A	A	A	A	B
	0.10µF (104)		N	N	N			S	S	S	S		A	A	A	A	B
	0.15µF (154)		N	N				S	S	S	S		A	A	A	A	
	0.22µF (224)	N	N	N				S	S	S	S		A	A	A	A	
	0.33µF (334)	N	N	N				S	S	S	X		B	B	B	B	
	0.47µF (474)	N	N	N				S	S	X	X		B	B	B	B	
	0.68µF (684)	N						S	X	X			B	B	D	D	
	1.0µF (105)	N	N					S	X	X			B	B	D	D	
	1.5µF (155)							S					D	D			
	2.2µF (225)						S	S	X				D	D	I		
	3.3µF (335)												D	D			
	4.7µF (475)						X	X					D	D	I		
	6.8µF (685)												I				
	10µF (106)											I	I	I			
	22µF (226)											I	I				

1. The letter in cell is expressed the symbol of product thickness.

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Y5V Dielectric 1206, 1210, 1812 Sizes

Dielectric		Y5V																	
Size		1206					1210							1812					
Rated Voltage (VDC)		6.3	10	16	25	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100
Capacitance	0.010μF (103)		B	B	B	B	B							C					D
	0.015μF (153)		B	B	B	B	B							C					D
	0.022μF (223)		B	B	B	B	B							C					D
	0.033μF (333)		B	B	B	B	B							C					D
	0.047μF (473)		B	B	B	B	B							C					D
	0.068μF (683)		B	B	B	B	B							C					D
	0.10μF (104)		B	B	B	B	B		C	C	C		C	C	D	D	D	D	D
	0.15μF (154)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.22μF (224)		B	B	B	B	C		C	C	C		C	C	D	D	D	D	D
	0.33μF (334)		B	B	B	B			C	C	C		C	C	D	D	D	D	D
	0.47μF (474)		B	B	B	B			C	C	C		C		D	D	D	D	D
	0.68μF (684)		B	B	B	B			C	C	C		C		D	D	D	D	D
	1.0μF (105)		C	C	C	C			C	C	C		C		D	D	D	D	D
	1.5μF (155)		C	C	C				C	C	C				D	D	D	D	
	2.2μF (225)		C	C	C	J			C	C	C		G		D	D	D	D	
	3.3μF (335)		J	J	J				C	C	C				D	D	D	D	
	4.7μF (475)		J	J	J	P			C	C	D		G		D	D	D	D	
	6.8μF (685)		J	J					C	C	D		K		D	D	D	D	
	10μF (106)		J	J	P				D	D	G	K	K		D	D	D	K	
	22μF (226)		P	P					K	K									
47μF (476)	P						K	K							M				
100μF (107)							M												

1. The letter in cell is expressed the symbol of product thickness.

X5R Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	100pF (101)			L	L	L										
	120pF (121)			L	L	L										
	150pF (151)			L	L	L										
	180pF (181)			L	L	L										
	220pF (221)			L	L	L										
	270pF (271)			L	L	L										
	330pF (331)			L	L	L										
	390pF (391)			L	L	L										
	470pF (471)			L	L	L										
	560pF (561)			L	L	L										
	680pF (681)			L	L	L										
	820pF (821)			L	L	L										

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	1,000pF (102)		L	L	L	L										
	1,500pF (152)		L	L												
	2,200pF (222)		L	L												
	2,700pF (272)		L	L												
	3,300pF (332)		L	L												
	4,700pF (472)		L	L												
	6,800pF (682)		L													
	0.010µF (103)	L	L	L	L											
	0.015µF (153)	L	L													
	0.022µF (223)	L	L													
	0.027µF (273)	L	L						N							
	0.033µF (333)	L	L						N							
	0.039µF (393)	L	L						N							
	0.047µF (473)	L	L						N							
	0.056µF (563)	L	L					N	N							
	0.068µF (683)	L	L					N	N							
	0.082µF (823)	L	L				N	N	N							
	0.10µF (104)	L	L	L	L		N	N	N	N	N					
	0.15µF (154)						N	N	N	N						
	0.22µF (224)	L	L				N	N	N	N	N			X	X	
	0.27µF (274)												X	X	X	
	0.33µF (334)						N	N				X	X	X	X	
	0.39µF (394)												X	X	X	
	0.47µF (474)	L					N	N	E	E	E	X	X	X	X	X
	0.68µF (684)						N	N				X	X	X	X	
	0.82µF (824)											X	X	X		
	1.0µF (105)	L	L*				N	N	N	N		X	X	X	X	X
	1.5µF (155)											X				
	2.2µF (225)	L*					N	N	E	E		X	X	X	X	X
	3.3µF (335)											X	X			
	4.7µF (475)						E*	E*	E*			X	X	X	X	
	6.8µF (685)															
	10µF (106)						E*	E*				X	X	X	X*	
	22µF (226)											X*	X*			
	47µF (476)											X*				

General Purpose Multilayer Ceramic Capacitor

0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Dielectric		X5R																		
Size		0805						1206						1210						
Rated Voltage (VDC)		4	6.3	10	16	25	50		6.3	10	16	25	50		6.3	10	16	25	50	
Capacitance	1.0μF (105)			D	D	D	I													
	1.5μF (155)		I	I	I	I			J	J						K	K			
	2.2μF (225)		I	I	I	I	I		J	J	P	P				K	K			
	3.3μF (335)		I	I	I	I			P	P	P									
	4.7μF (475)		I	I	I	I	I		P	P	P	P	P			K	K	K		
	6.8uF (685)								P	P										
	10μF (106)		I	I	I	I	I		P	P	P	P	P			K	K	K	K	M
	22μF (226)		I	I*	I*	I*			P	P	P	P				M	M	M	M	
	47μF (476)		I*	I*					P	P						M	M	M		
	100μF (107)	I*							P*							M*	M*			
	220μF (227)							P*							M*					

The letter in cell is expressed the symbol of product thickness.

The letter in cell with “ * ” mark is expressed product not in 10% (code “K”) tolerance.

X6S Dielectric 0201, 0402, 0603, 0805, 1206, 1210 Sizes

Dielectric		X6S																											
Size		0201		0402			0603					0805						1206					1210						
Rated Voltage (VDC)		4	6.3	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	
Capacitance	0.10μF (104)	L	L																										
	0.15μF (154)																												
	0.22μF (224)		L																										
	0.33μF (334)																												
	0.47μF (474)			E																									
	0.68μF (684)																												
	1.0μF (105)	L*		E	E	E	E																						
	1.5μF (155)																												
	2.2μF (225)			E	E	E						X																	
	3.3μF (335)																												
	4.7μF (475)							X		X	X							I	I										
	6.8uF (685)																												
	10μF (106)							X*	X*	X*		I	I	I	I	I					G								
	22μF (226)							X*	X*					I*	I*	I*				P	P*						M		
	47μF (476)												I*						P						M	M	M		
	100μF (107)																								M*				

1. The letter in cell is expressed the symbol of product thickness.

2. The letter in cell with “ * ” mark is expressed product not in 10% (code “K”) tolerance

Packaging Style and Quantity

Size	Thickness (mm) Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15,000	70,000	-	-
	0.30±0.05	L	15,000	-	-	-
	0.30±0.09	L	15,000	-	-	-

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



Size	Thickness (mm) Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50±0.05	N	10,000	50,000	-	-
	0.50+0.02/-0.05	Q	10,000	50,000	-	-
	0.50±0.20	E	10,000	-	-	-
0603 (1608)	0.50±0.10	H	4,000	-	-	-
	0.80±0.07	S	4,000	15,000	-	-
	0.80+0.15/-0.10	X	4,000	15,000	-	-
0805 (2012)	0.50±0.10	H	4,000	15,000	-	-
	0.60±0.10	A	4,000	15,000	-	-
	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	1.25±0.10	D	-	-	3,000	10,000
	1.25±0.20	I	-	-	3,000	10,000
1206 (3216)	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	0.95±0.10	C	-	-	3,000	10,000
	1.15±0.15	J	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
	1.60±0.20	G	-	-	2,000	10,000
	1.60+0.30/-0.10	P	-	-	2,000	9,000
1210 (3225)	0.85±0.10	T	-	-	3,000	10,000
	0.95±0.10	C	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
	1.60±0.20	G	-	-	2,000	-
	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
1808 (4520)	1.25±0.10	D	-	-	2,000	10,000
	1.10±0.15	F	-	-	2,000	10,000
	1.60±0.20	G	-	-	2,000	8,000
	2.00±0.20	K	-	-	1,000	6,000
1812 (4532)	1.25±0.10	D	-	-	1,000	5,000
	1.60±0.20	G	-	-	1,000	-
	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	3,000
	2.80±0.30	U	-	-	500	-

Dimensions : Millimetres

Reliability Test Conditions and Requirements:

No	Item	Test Condition	Requirements
1	Visual and Mechanical	-	No remarkable defect. Dimensions to conform to individual specification sheet.

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



No	Item	Test Condition	Requirements																																																						
2	Capacitance		*Shall not exceed the limits given in the detailed spec.																																																						
			NP0: Cap≥30pF, Q≥1000; Cap<30pF,Q≥400+20C X7R,X5R,X6S:																																																						
			<table><tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr><tr><td rowspan="2">≧ 100V</td><td rowspan="2">≧ 2.5%</td><td>≧ 3%</td><td>1206 ≧ 0.47μF</td></tr><tr><td>≧ 5%</td><td>0805 > 0.1μF, 0603 ≧ 0.068μF, 1206 > 1μF; 1210 ≧ 2.2μF; TT series</td></tr><tr><td rowspan="3">50V</td><td rowspan="3">≧ 2.5%</td><td>≧ 3%</td><td>0201(50V); 0603 ≧ 0.047μF; 0805 ≧ 0.18μF; 1206 ≧ 0.47μF</td></tr><tr><td>≧ 5%</td><td>1210 ≧ 4.7μF</td></tr><tr><td>≧ 10%</td><td>0402 ≧ 0.1μF;0603>0.1μF; 0805 ≧ 1μF; 1206 ≧ 2.2μF;1210 ≧ 10μF; TT series</td></tr><tr><td>35V</td><td>≧ 3.5%</td><td>≧ 10%</td><td>0603 ≧ 1μF;0805≥2.2μF;1206 ≧ 2.2μF; 1210 ≧ 10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≧ 3.5%</td><td>≧ 5%</td><td>0201 ≧ 0.01μF;0805 ≧ 1μF; 1210 ≧ 10μF</td></tr><tr><td>≧ 7%</td><td>0603 ≧ 0.33μF; 1206 ≧ 4.7μF</td></tr><tr><td>≧ 10%</td><td>0201 ≧ 0.1μF;0402 ≧ 0.10μF;0603 ≧ 0.47μF; 0805 ≧ 2.2μF; 1206 ≧ 6.8μF ; 1210 ≧ 22μF ; TT series</td></tr><tr><td>≧ 12.5%</td><td>0402 ≧ 0.47μF</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">≧ 3.5%</td><td>≧ 5%</td><td>0201 ≧ 0.01μF;0402 ≧ 0.033μF;0603 ≧ 0.15μF; 0805 ≧ 0.68μF;1206 ≧ 2.2μF;1210 ≧ 4.7μF</td></tr><tr><td>≧ 10%</td><td>0201 ≧ 0.1uF; 0402 ≧ 0.22uF; 0603 ≧ 0.68μF;0805 ≧ 2.2μF; 1206 ≧ 4.7μF; 1210 ≧ 22μF; TT series</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≧ 5%</td><td>≧ 10%</td><td>0201 ≧ 0.012μF;0402 ≧ 0.33μF(0402/ X7R ≧ 0.22μF); TT series; 0603 ≧ 0.33μF; 0805 ≧ 2.2μF;1206 ≧ 2.2μF;1210 ≧ 22μF; 01R5</td></tr><tr><td>≧ 15%</td><td>0201 ≧ 0.1μF; 0402 ≧ 1μF</td></tr><tr><td rowspan="2">6.3V</td><td rowspan="2">≧ 10%</td><td>≧ 15%</td><td>0201 ≧ 0.1μF;0402 ≧ 1μF;0603 ≧ 10μF; 0805 ≧ 4.7μF;1206 ≧ 47μF :1210 ≧ 100μF; TT series</td></tr><tr><td>≧ 20%</td><td>0402 ≧ 2.2μF</td></tr><tr><td>4V</td><td>≧ 15%</td><td>-</td><td>-</td></tr></table>	Rated vol.	D.F.≤	Exception of D.F.≤		≧ 100V	≧ 2.5%	≧ 3%	1206 ≧ 0.47μF	≧ 5%	0805 > 0.1μF, 0603 ≧ 0.068μF, 1206 > 1μF; 1210 ≧ 2.2μF; TT series	50V	≧ 2.5%	≧ 3%	0201(50V); 0603 ≧ 0.047μF; 0805 ≧ 0.18μF; 1206 ≧ 0.47μF	≧ 5%	1210 ≧ 4.7μF	≧ 10%	0402 ≧ 0.1μF;0603>0.1μF; 0805 ≧ 1μF; 1206 ≧ 2.2μF;1210 ≧ 10μF; TT series	35V	≧ 3.5%	≧ 10%	0603 ≧ 1μF;0805≥2.2μF;1206 ≧ 2.2μF; 1210 ≧ 10μF	25V	≧ 3.5%	≧ 5%	0201 ≧ 0.01μF;0805 ≧ 1μF; 1210 ≧ 10μF	≧ 7%	0603 ≧ 0.33μF; 1206 ≧ 4.7μF	≧ 10%	0201 ≧ 0.1μF;0402 ≧ 0.10μF;0603 ≧ 0.47μF; 0805 ≧ 2.2μF; 1206 ≧ 6.8μF ; 1210 ≧ 22μF ; TT series	≧ 12.5%	0402 ≧ 0.47μF	16V	≧ 3.5%	≧ 5%	0201 ≧ 0.01μF;0402 ≧ 0.033μF;0603 ≧ 0.15μF; 0805 ≧ 0.68μF;1206 ≧ 2.2μF;1210 ≧ 4.7μF	≧ 10%	0201 ≧ 0.1uF; 0402 ≧ 0.22uF; 0603 ≧ 0.68μF;0805 ≧ 2.2μF; 1206 ≧ 4.7μF; 1210 ≧ 22μF; TT series	10V	≧ 5%	≧ 10%	0201 ≧ 0.012μF;0402 ≧ 0.33μF(0402/ X7R ≧ 0.22μF); TT series; 0603 ≧ 0.33μF; 0805 ≧ 2.2μF;1206 ≧ 2.2μF;1210 ≧ 22μF; 01R5	≧ 15%	0201 ≧ 0.1μF; 0402 ≧ 1μF	6.3V	≧ 10%	≧ 15%	0201 ≧ 0.1μF;0402 ≧ 1μF;0603 ≧ 10μF; 0805 ≧ 4.7μF;1206 ≧ 47μF :1210 ≧ 100μF; TT series	≧ 20%	0402 ≧ 2.2μF	4V	≧ 15%	-	-
Rated vol.	D.F.≤	Exception of D.F.≤																																																							
≧ 100V	≧ 2.5%	≧ 3%	1206 ≧ 0.47μF																																																						
		≧ 5%	0805 > 0.1μF, 0603 ≧ 0.068μF, 1206 > 1μF; 1210 ≧ 2.2μF; TT series																																																						
50V	≧ 2.5%	≧ 3%	0201(50V); 0603 ≧ 0.047μF; 0805 ≧ 0.18μF; 1206 ≧ 0.47μF																																																						
		≧ 5%	1210 ≧ 4.7μF																																																						
		≧ 10%	0402 ≧ 0.1μF;0603>0.1μF; 0805 ≧ 1μF; 1206 ≧ 2.2μF;1210 ≧ 10μF; TT series																																																						
35V	≧ 3.5%	≧ 10%	0603 ≧ 1μF;0805≥2.2μF;1206 ≧ 2.2μF; 1210 ≧ 10μF																																																						
25V	≧ 3.5%	≧ 5%	0201 ≧ 0.01μF;0805 ≧ 1μF; 1210 ≧ 10μF																																																						
		≧ 7%	0603 ≧ 0.33μF; 1206 ≧ 4.7μF																																																						
		≧ 10%	0201 ≧ 0.1μF;0402 ≧ 0.10μF;0603 ≧ 0.47μF; 0805 ≧ 2.2μF; 1206 ≧ 6.8μF ; 1210 ≧ 22μF ; TT series																																																						
		≧ 12.5%	0402 ≧ 0.47μF																																																						
16V	≧ 3.5%	≧ 5%	0201 ≧ 0.01μF;0402 ≧ 0.033μF;0603 ≧ 0.15μF; 0805 ≧ 0.68μF;1206 ≧ 2.2μF;1210 ≧ 4.7μF																																																						
		≧ 10%	0201 ≧ 0.1uF; 0402 ≧ 0.22uF; 0603 ≧ 0.68μF;0805 ≧ 2.2μF; 1206 ≧ 4.7μF; 1210 ≧ 22μF; TT series																																																						
10V	≧ 5%	≧ 10%	0201 ≧ 0.012μF;0402 ≧ 0.33μF(0402/ X7R ≧ 0.22μF); TT series; 0603 ≧ 0.33μF; 0805 ≧ 2.2μF;1206 ≧ 2.2μF;1210 ≧ 22μF; 01R5																																																						
		≧ 15%	0201 ≧ 0.1μF; 0402 ≧ 1μF																																																						
6.3V	≧ 10%	≧ 15%	0201 ≧ 0.1μF;0402 ≧ 1μF;0603 ≧ 10μF; 0805 ≧ 4.7μF;1206 ≧ 47μF :1210 ≧ 100μF; TT series																																																						
		≧ 20%	0402 ≧ 2.2μF																																																						
4V	≧ 15%	-	-																																																						
			Y5V:																																																						
			<table><tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr><tr><td rowspan="2">≧ 50V</td><td rowspan="2">5%</td><td>7%</td><td>0603≧0.1μF;0805≧0.47μF;1206≧4.7μF; TT series</td></tr><tr><td>12.5%</td><td>1210≧6.8μF</td></tr><tr><td>35V</td><td>7%</td><td>-</td><td>-</td></tr><tr><td rowspan="2">25V</td><td rowspan="2">5%</td><td>7%</td><td>0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF</td></tr><tr><td>9%</td><td>0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF; TT series</td></tr><tr><td rowspan="2">16V (C<1μF)</td><td rowspan="2">7%</td><td>9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr><tr><td>12.5%</td><td>0402≧0.22μF</td></tr><tr><td>16V (C≧1.0μF)</td><td>9%</td><td>12.5%</td><td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF; 1812≧47μF; TT series</td></tr><tr><td>10V</td><td>12.5%</td><td>20%</td><td>0402≧0.47μF</td></tr><tr><td>6.3V</td><td>20%</td><td>-</td><td>-</td></tr></table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≧ 50V	5%	7%	0603≧0.1μF;0805≧0.47μF;1206≧4.7μF; TT series	12.5%	1210≧6.8μF	35V	7%	-	-	25V	5%	7%	0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF	9%	0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF; TT series	16V (C<1μF)	7%	9%	0402≧0.068μF; 0603≧0.68μF	12.5%	0402≧0.22μF	16V (C≧1.0μF)	9%	12.5%	0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF; 1812≧47μF; TT series	10V	12.5%	20%	0402≧0.47μF	6.3V	20%	-	-																
Rated vol.	D.F.≤	Exception of D.F. ≤																																																							
≧ 50V	5%	7%	0603≧0.1μF;0805≧0.47μF;1206≧4.7μF; TT series																																																						
		12.5%	1210≧6.8μF																																																						
35V	7%	-	-																																																						
25V	5%	7%	0402≧0.047μF;0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF																																																						
		9%	0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF; TT series																																																						
16V (C<1μF)	7%	9%	0402≧0.068μF; 0603≧0.68μF																																																						
		12.5%	0402≧0.22μF																																																						
16V (C≧1.0μF)	9%	12.5%	0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF; 1812≧47μF; TT series																																																						
10V	12.5%	20%	0402≧0.47μF																																																						
6.3V	20%	-	-																																																						

General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



No	Item	Test Condition	Requirements																																										
4	Dielectric Strength	To apply voltage (≤100V) 250%. Duration: 1 to 5 sec. Charge and discharge current less than 50mA.	No evidence of damage or flash over during test.																																										
5	Insulation Resistance	To apply rated voltage for max. 120 sec.	10GΩ or $RxC \geq 500\Omega \cdot F$ whichever is smaller. Class II (X7R, X5R, X6S, Y5V) <table><thead><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr></thead><tbody><tr><td>100V: X7R</td><td rowspan="7">10GΩ or $RxC \geq 100\Omega F$ whichever is smaller.</td></tr><tr><td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td></tr><tr><td>35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td></tr><tr><td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td></tr><tr><td>16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF</td></tr><tr><td>10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td></tr><tr><td>6.3V ; 4V; TT series</td></tr><tr><td>All X6S items</td><td rowspan="7">10GΩ or $RxC \geq 50 \Omega \cdot F$ whichever is smaller.</td></tr><tr><td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF</td></tr><tr><td>35V: 0603≥1μF</td></tr><tr><td>25V: 0201≥0.1μF; 0402≥0.22μF; 0603≥10μF; 0805≥10μF; 1206≥22μF</td></tr><tr><td>16V: 0603≥10μF</td></tr><tr><td>10V: 0201>0.1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF</td></tr><tr><td>6.3V: 0201≥0.1μF; 0603>4.7μF; 1206≥10μF</td></tr><tr><td>4V: 0603≥22μF; 0805≥47μF</td></tr></tbody></table>	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or $RxC \geq 100\Omega F$ whichever is smaller.	50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF	35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF	25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF	16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF	10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	6.3V ; 4V; TT series	All X6S items	10GΩ or $RxC \geq 50 \Omega \cdot F$ whichever is smaller.	50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF	35V: 0603≥1μF	25V: 0201≥0.1μF; 0402≥0.22μF; 0603≥10μF; 0805≥10μF; 1206≥22μF	16V: 0603≥10μF	10V: 0201>0.1μF; 0603≥10μF; 0805≥47μF; TT21>4.7μF	6.3V: 0201≥0.1μF; 0603>4.7μF; 1206≥10μF	4V: 0603≥22μF; 0805≥47μF																							
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6	Temperature Coefficient	With no electrical load. <table><tr><td>T.C.</td><td>Operating Temp</td></tr><tr><td>NPO</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr><tr><td>X5R</td><td>-55~ 85°C at 25°C</td></tr><tr><td>X6S</td><td>-55~105°C at 25°C</td></tr><tr><td>Y5V</td><td>-25~ 85°C at 20°C</td></tr></table> To apply voltage* <table><tr><td>01005</td><td>0201</td></tr><tr><td>Cap≤0.01μF: 0.5V</td><td>Cap<0.1μF: 1V</td></tr><tr><td>Cap>0.01μF: 0.2V</td><td>0.1μF≤Cap<1μF: 0.2V</td></tr><tr><td></td><td>Cap≥1μF: 0.1V</td></tr><tr><td>0402</td><td>0603</td></tr><tr><td>Cap<1μF: 1V</td><td>Cap≤1μF: 1V</td></tr><tr><td>Cap=1μF: 0.5V</td><td>1μF<Cap≤4.7μF: 0.5V</td></tr><tr><td>1μF<Cap<10μF: 0.2V</td><td>Cap>4.7μF: 0.2V</td></tr><tr><td>Cap≥10μF: 0.1V</td><td></td></tr></table>	T.C.	Operating Temp	NPO	-55~125°C at 25°C	X7R	-55~125°C at 25°C	X5R	-55~ 85°C at 25°C	X6S	-55~105°C at 25°C	Y5V	-25~ 85°C at 20°C	01005	0201	Cap≤0.01μF: 0.5V	Cap<0.1μF: 1V	Cap>0.01μF: 0.2V	0.1μF≤Cap<1μF: 0.2V		Cap≥1μF: 0.1V	0402	0603	Cap<1μF: 1V	Cap≤1μF: 1V	Cap=1μF: 0.5V	1μF<Cap≤4.7μF: 0.5V	1μF<Cap<10μF: 0.2V	Cap>4.7μF: 0.2V	Cap≥10μF: 0.1V		<table><tr><td>T.C.</td><td>Capacitance Change</td></tr><tr><td>NPO</td><td>Within ±30ppm/°C</td></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>X5R</td><td>Within ±15%</td></tr><tr><td>X6S</td><td>Within ±22%</td></tr><tr><td>Y5V</td><td>Within +30%/-80%</td></tr></table>	T.C.	Capacitance Change	NPO	Within ±30ppm/°C	X7R	Within ±15%	X5R	Within ±15%	X6S	Within ±22%	Y5V	Within +30%/-80%
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General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



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7	Adhesive Strength of Termination	Pressurizing force: 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec.		No remarkable damage or removal of the terminations.															
8	Vibration Resistance	Vibration frequency: 10~55 Hz/min. Total amplitude: 1.5mm Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) Measurement to be made after keeping at room temp. for 24±2 hrs.		No remarkable damage. Cap change and Q/D.F.: To meet initial spec.															
9	Solderability	Solder temperature: 235±5°C Dipping time: 2±0.5 sec.		95% min. coverage of all metalized area.															
10.	Bending Test	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. Measurement to be made after keeping at room temp. for 24±2 hrs.		No remarkable damage. Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)															
11	Resistance to Soldering Heat	Solder temperature: 260±5°C Dipping time: 10±1 sec Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.		No remarkable damage. Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements. 25% max. leaching on each edge.															
12	Temperature Cycle	Conduct the five cycles according to the temperatures and time.		No remarkable damage. Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R, X6S: within ±7.5% Y5V: within ±20% Q/D.F., I.R. and dielectric strength: To meet initial requirements.															
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13	Humidity (Damp Heat) Steady State	Test temp.: 40±2°C Humidity: 90~95% RH Test time: 500+24/-0hrs. Before initial measurement (Class II only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.	No remarkable damage. Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R, X6S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF, within ±25% **10V: 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C X7R, X5R, X6S: <table border="1"> <thead> <tr> <th>Rated vol.</th><th>D.F. ≤</th><th colspan="2">Exception of D.F. ≤</th></tr> </thead> <tbody> <tr> <td rowspan="2">≥100V</td><td rowspan="2">≤3%</td><td>≤6%</td><td>1206≥0.47μF</td></tr> <tr> <td>≤7.5%</td><td>0805>0.1μF, 0603≥0.068μF 1206>1μF; 1210≥2.2μF; TT series</td></tr> <tr> <td rowspan="3">≥50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr> <tr> <td>≤10%</td><td>1210≥4.7μF</td></tr> <tr> <td>≤20%</td><td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF TT series</td></tr> <tr> <td>35V</td><td>≤5%</td><td>≤20%</td><td>0603≥1μF; 0805≥2.2μF; 1210≥10μF</td></tr> <tr> <td rowspan="4">25V</td><td rowspan="4">≤5%</td><td>≤10%</td><td>0201≥0.01μF; 0805≥1μF; 1210≥10μF</td></tr> <tr> <td>≤14%</td><td>0603≥0.33μF; 1206≥4.7μF</td></tr> <tr> <td>≤15%</td><td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series</td></tr> <tr> <td>≤20%</td><td>0402≥0.47μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td></tr> <tr> <td>≤15%</td><td>0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr> <tr> <td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td></tr> <tr> <td>≤20%</td><td>0201≥0.1μF; 0402≥1μF TT series</td></tr> <tr> <td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF; TT series</td></tr> <tr> <td>4V</td><td>≤20%</td><td>-</td><td>-</td></tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0805>0.1μF, 0603≥0.068μF 1206>1μF; 1210≥2.2μF; TT series	≥50V	≤3%	≤6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF TT series	35V	≤5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF; 1206≥4.7μF	≤15%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series	≤20%	0402≥0.47μF	16V	≤5%	≤10%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	≤15%	0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.1μF; 0402≥1μF TT series	6.3V	≤15%	≤30%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF; TT series	4V	≤20%	-	-
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			16V (C≥1.0μF)	12.5%	20%	0603≥2.2μF; 0805≥3.3μF; 1206≥10μF; 1210≥22μF; 1812≥47μF																																	
			10V	20%	30%	0402≥0.47μF																																	
6.3V	30%	-	-																																				
*I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)																																							
<table><tr><th>Rated voltage</th><th>Insulation Resistance</th></tr><tr><td>100V: X7R</td><td rowspan="8">1GΩ or Rx C≥10 Ω-F whichever is smaller.</td></tr><tr><td>50V: 0402≥0.1μF;0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF</td></tr><tr><td>35V: 0603≥1μF; 0805≥2.2μF;1210≥10μF</td></tr><tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF</td></tr><tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF</td></tr><tr><td>10V:0201≥47nF;0402≥0.47μF;0603≥0.47 μF;0805≥2.2μF;</td></tr><tr><td>1206≥4.7μF;1210≥47μF</td></tr><tr><td>6.3V ; 4V; TT series ; All X6S items</td></tr></table>		Rated voltage	Insulation Resistance	100V: X7R	1GΩ or Rx C≥10 Ω-F whichever is smaller.	50V: 0402≥0.1μF;0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	35V: 0603≥1μF; 0805≥2.2μF;1210≥10μF	25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF; 1206≥10μF;1210≥47μF	10V:0201≥47nF;0402≥0.47μF;0603≥0.47 μF;0805≥2.2μF;	1206≥4.7μF;1210≥47μF	6.3V ; 4V; TT series ; All X6S items																											
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6.3V ; 4V; TT series ; All X6S items																																							
14	Humidity (Damp Heat) Load	Test temp.: 40±2°C Humidity: 90~95%RH Test time: 500+24/-0 hrs. To apply voltage : rated voltage. Before initial measurement (Class II only): To apply test voltage for 1hr at 40°C and then set for 24±2 hrs at room temp. Measurement to be made after keeping at room temp. for 24±2 hrs.	No remarkable damage. Cap change: NP0: ±7.5% or 0.75pF whichever is larger. X7R, X5R, X6S: ≥10V**,within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF,within ±25% **10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: C≥30pF,Q≥200;C<30pF, Q≥100+10/3C																																				

No	Item	Test Condition	Requirements																																																				
14	Humidity (Damp Heat) Load		X7R, X5R, X6S:																																																				
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No	Item	Test Condition	Requirements																																															
14	Humidity (Damp Heat) Load		*I.R.: ≥10V, 500MΩ or 25 Ω-F whichever is smaller. Class II (X7R, X5R, X6S, Y5V)																																															
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15.	High Temperature Load (Endurance)	*Test temp.: NP0, X7R/X7E: 125±3°C X6S: 105±3°C X5R, Y5V: 85±3°C *Test time: 1000+24/-0 hrs. *To apply voltage: (1) ≤6.3V or C≥10μF or TT series: 150% of rated voltage. (2) 10V≤Ur<500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur≥630V: 120% of rated voltage. (5) 100% of rated voltage for below range. <table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capaci- tance range</th></tr><tr><td>0201</td><td>X5R/X7R/ X6S</td><td>≤10V</td><td>C≥0.1μF</td></tr><tr><td>0402</td><td>X5R/X7R/ X6S Y5V</td><td>6.3V,10V 16V, 25V</td><td>C≥1.0μF</td></tr><tr><td rowspan="3">0603</td><td rowspan="3">X5R/X7R/ X6S</td><td>4V</td><td>C≥22μF</td></tr><tr><td>6.3V,10V</td><td>C≥4.7μF</td></tr><tr><td>25V,35V</td><td>C≥1.0μF</td></tr><tr><td rowspan="3">0805</td><td rowspan="3">X5R/X7R/ X6S</td><td>4V</td><td>C≥47μF</td></tr><tr><td>6.3V</td><td>C≥22μF</td></tr><tr><td>10V~50V</td><td>C≥10μF</td></tr><tr><td rowspan="2">1206</td><td>X5R/X7R/</td><td>6.3V</td><td>C≥47μF</td></tr><tr><td>NP0</td><td>3,000V</td><td>C≥1.5pF</td></tr><tr><td>TT18</td><td>Y5V</td><td>6.3V,10</td><td>C≥2.2μF</td></tr><tr><td>TT21</td><td>Y5V</td><td>6.3V</td><td>C≥10μF</td></tr><tr><td>TT31</td><td>Y5V</td><td>6.3V</td><td>C≥22μF</td></tr></table>	Size	Dielectric	Rated voltage	Capaci- tance range	0201	X5R/X7R/ X6S	≤10V	C≥0.1μF	0402	X5R/X7R/ X6S Y5V	6.3V,10V 16V, 25V	C≥1.0μF	0603	X5R/X7R/ X6S	4V	C≥22μF	6.3V,10V	C≥4.7μF	25V,35V	C≥1.0μF	0805	X5R/X7R/ X6S	4V	C≥47μF	6.3V	C≥22μF	10V~50V	C≥10μF	1206	X5R/X7R/	6.3V	C≥47μF	NP0	3,000V	C≥1.5pF	TT18	Y5V	6.3V,10	C≥2.2μF	TT21	Y5V	6.3V	C≥10μF	TT31	Y5V	6.3V	C≥22μF	No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S: ≥10V**,within ±12.5%; ≤6.3V within ±25%; TT series & C≥ 1uF,within ±25% **10V: 0603≥4.7μF;0402≥1μF;0201≥0.1μF, within ±25%; Y5V: ≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. value: NP0: More than 30pF, Q≥350 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C
			Size	Dielectric	Rated voltage	Capaci- tance range																																												
			0201	X5R/X7R/ X6S	≤10V	C≥0.1μF																																												
			0402	X5R/X7R/ X6S Y5V	6.3V,10V 16V, 25V	C≥1.0μF																																												
			0603	X5R/X7R/ X6S	4V	C≥22μF																																												
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			0805	X5R/X7R/ X6S	4V	C≥47μF																																												
					6.3V	C≥22μF																																												
					10V~50V	C≥10μF																																												
1206	X5R/X7R/	6.3V	C≥47μF																																															
	NP0	3,000V	C≥1.5pF																																															
TT18	Y5V	6.3V,10	C≥2.2μF																																															
TT21	Y5V	6.3V	C≥10μF																																															
TT31	Y5V	6.3V	C≥22μF																																															

No	Item	Test Condition	Requirements																																																																																																						
15	High Temperature Load (Endurance)	(6) 150% of rated voltage for below range.	X7R, X5R, X6S:																																																																																																						
		<table><tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr><tr><td>0201</td><td>X5R/X7R/X6S</td><td>16V/25V</td><td>C≥0.1μF</td></tr><tr><td rowspan="2">0402</td><td rowspan="2">X5R/X7R/X6S</td><td>50V</td><td>C≥0.1μF</td></tr><tr><td>10V~25V</td><td>C≥0.22μF</td></tr><tr><td></td><td>Y5V</td><td>16V</td><td>C≥0.47μF</td></tr><tr><td rowspan="2">0603</td><td rowspan="2">X5R/X7R/X6S</td><td>10V, 16V, 50V</td><td>C≥1.0μF</td></tr><tr><td>Y5V</td><td>16V</td><td>C≥2.2μF</td></tr><tr><td rowspan="3">0805</td><td rowspan="3">X5R/X7R/X6S</td><td>10~50V</td><td>C≥4.7μF</td></tr><tr><td rowspan="2">X7R</td><td>50V</td><td>C≥2.2μF</td></tr><tr><td>100V</td><td>C≥0.47μF</td></tr><tr><td></td><td>Y5V</td><td>16V</td><td>C≥4.7μF</td></tr><tr><td>1206</td><td>X5R/X7R/X6S</td><td>100V</td><td>C≥1.0μF</td></tr><tr><td>1210</td><td>X5R/X7R/X6S</td><td>50V~100V</td><td>C≥2.2μF</td></tr><tr><td>1825 2220 2225</td><td>X7R</td><td>100V~250V</td><td>C≥1.0μF</td></tr></table>	Size	Dielectric	Rated voltage	Capacitance range	0201	X5R/X7R/X6S	16V/25V	C≥0.1μF	0402	X5R/X7R/X6S	50V	C≥0.1μF	10V~25V	C≥0.22μF		Y5V	16V	C≥0.47μF	0603	X5R/X7R/X6S	10V, 16V, 50V	C≥1.0μF	Y5V	16V	C≥2.2μF	0805	X5R/X7R/X6S	10~50V	C≥4.7μF	X7R	50V	C≥2.2μF	100V	C≥0.47μF		Y5V	16V	C≥4.7μF	1206	X5R/X7R/X6S	100V	C≥1.0μF	1210	X5R/X7R/X6S	50V~100V	C≥2.2μF	1825 2220 2225	X7R	100V~250V	C≥1.0μF	<table><tr><th>Rated vol.</th><th>D.F.≤</th><th colspan="2">Exception of D.F. ≤</th></tr><tr><td rowspan="2">≥100V</td><td rowspan="2">≤3%</td><td>≤6%</td><td>1206≥0.47μF</td></tr><tr><td>≤7.5%</td><td>0805>0.1μF, 0603≥0.068μF 1206>1μF; 1210≥2.2μF; TT series</td></tr><tr><td rowspan="3">≥50V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td></tr><tr><td>≤10%</td><td>1210≥4.7μF</td></tr><tr><td>≤20%</td><td>0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF; TT series</td></tr><tr><td>35V</td><td>≤5%</td><td>≤20%</td><td>0603≥1μF; 0805≥2.2μF; 1210≥10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≤5%</td><td>≤10%</td><td>0201≥0.01μF; 0805≥1μF; 1210≥10μF</td></tr><tr><td>≤14%</td><td>0603≥0.33μF; 1206≥4.7μF</td></tr><tr><td>≤15%</td><td>0201≥0.1μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series</td></tr><tr><td>≤20%</td><td>0402≥0.47μF</td></tr><tr><td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td></tr><tr><td>≤15%</td><td>0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series</td></tr><tr><td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series</td></tr><tr><td>≤20%</td><td>0201≥0.1μF; 0402≥1μF; TT series; 01R5</td></tr><tr><td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF : 1210≥100μF; TT series</td></tr><tr><td>4V</td><td>≤20%</td><td>-</td><td>-</td></tr></table>	Rated vol.	D.F.≤	Exception of D.F. ≤		≥100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0805>0.1μF, 0603≥0.068μF 1206>1μF; 1210≥2.2μF; TT series	≥50V	≤3%	≤6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1210≥4.7μF	≤20%	0402≥0.1μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF; TT series	35V	≤5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF	≤14%	0603≥0.33μF; 1206≥4.7μF	≤15%	0201≥0.1μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF ; 1210≥22μF; TT series	≤20%	0402≥0.47μF	16V	≤5%	≤10%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	≤15%	0201≥0.1μF; 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series	10V	≤7.5%	≤15%	0201≥0.012μF 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; TT series	≤20%	0201≥0.1μF; 0402≥1μF; TT series; 01R5	6.3V	≤15%	≤30%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF : 1210≥100μF; TT series	4V	≤20%	-	-
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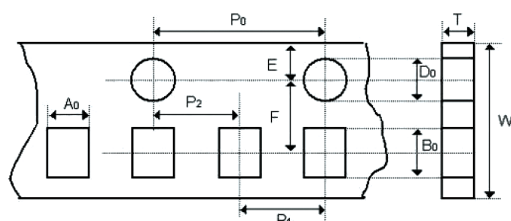
General Purpose Multilayer Ceramic Capacitor
0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



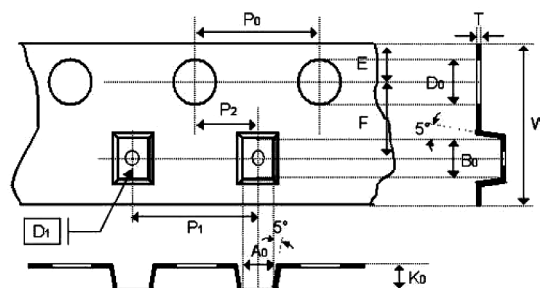
No	Item	Test Condition	Requirements	
15	High Temperature Load (Endurance		*I.R.: $\geq 10V$, $1G\Omega$ or $50\Omega \cdot F$ whichever is smaller. Class II (X7R, X5R, X6S, Y5V)	
			Rated voltage	Insulation Resistance
			100V: X7R	1G Ω or RxC $\geq 10\Omega \cdot F$ whichever is smaller.
			50V: 0402 $\geq 0.1\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$	
			35V: 0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1210 $\geq 10\mu F$	
			25V: 0402 $\geq 1\mu F$; 0603 $\geq 2.2\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 10\mu F$; 1210 $\geq 10\mu F$	
			16V: 0402 $\geq 0.22\mu F$; 0603 $\geq 1\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 10\mu F$; 1210 $\geq 47\mu F$	
			10V: 0201 $\geq 47nF$; 0402 $\geq 0.47\mu F$; 0603 $\geq 0.47\mu F$; 0805 $\geq 2.2\mu F$;	
			1206 $\geq 4.7\mu F$; 1210 $\geq 47\mu F$	
			6.3V ; 4V; TT series ; All X6S items	

Appendixes

Tape & Reel Dimensions



The dimension of paper tape



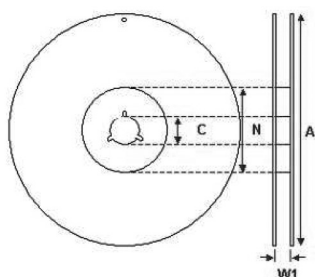
The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
A ₀	0.39 +/-0.07	0.70 +/-0.2	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20	< 2.50	< 3.90	< 3.90
B ₀	0.69 +/-0.07	1.20 +/-0.2	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 3.95	< 5.30	< 5.30	< 5.30
T	≤ 0.50	≤ 0.80	≤ 1.20	≤ 1.15	≤ 1.30	0.23 +/-0.1	≤ 1.30	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.25 +/-0.1	0.25 +/-0.1	0.25 +/-0.1
K ₀	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.00	< 2.50	< 2.50	< 3.50
W	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20	12.00 +/-0.20
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	8.00 +/-0.10	8.00 +/-0.10
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.10	2.00 +/-0.10	2.00 +/-0.10

General Purpose Multilayer Ceramic Capacitor 0201 to 1812 Sizes, NP0, X7R, Y5V, X6S & X5R Dielectrics



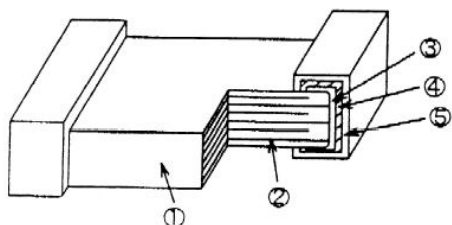
Size	0201	0402	0603	0805			1206			1210			1808	1812	
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M	D,F,G,K	D,F,G,K	M,U
D ₀	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.55 +/-0.05	1.50 +0.1/-0	1.55 +/-0.05	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.50 +/-0.10	1.50 +/-0.10	1.50 +/-0.10
E	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.05	1.75 +/-0.10	1.75 +/-0.05	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10
F	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	5.50 +/-0.10	5.50 +/-0.10	5.50 +/-0.10



Size	0201, 0402, 0603, 0805, 1206, 1210			1812
Reel size	7"	10"	13"	7"
C	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2	13 +0.5/-0.2
W ₁	8.4 +1.5/-0	8.4 +1.5/-0	8.4 +1.5/-0	12.4 +2.0/-0
A	178 ±0.10	250 ±1	330 ±1	178 ±0.10
N	60 +1/-0	100 ±1	100 ±1	60 +1.0/-0

The dimension of reel

Constructions:



No.	Name	NP0, X7R, X5R, X6S, Y5V
1	Ceramic material	BaTiO ₃ based
2	Inner electrode	Ni
3	Termination	Inner layer
4		Middle layer
5		Outer layer

Storage and handling conditions

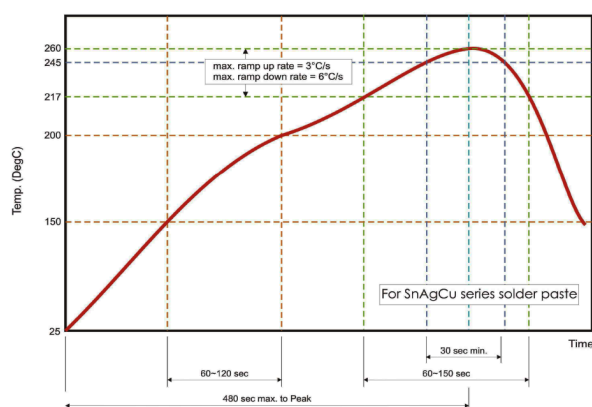
- (1) To store products at 5°C to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

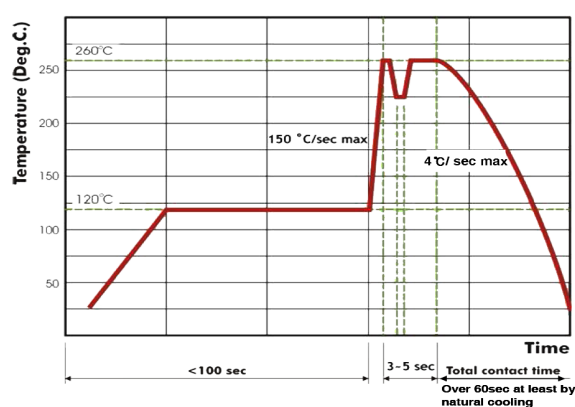
- The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

Recommended Soldering Conditions:

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste. If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N₂ within oven are recommended.



Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.



Recommended wave soldering profile for SMT process with SnAgCu series solder.

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